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PLANT PROTECTION BULLETIN

A PUBLICATION OF THE WORLD REPORTING SERVICE ON PLANT DISEASES AND PESTS

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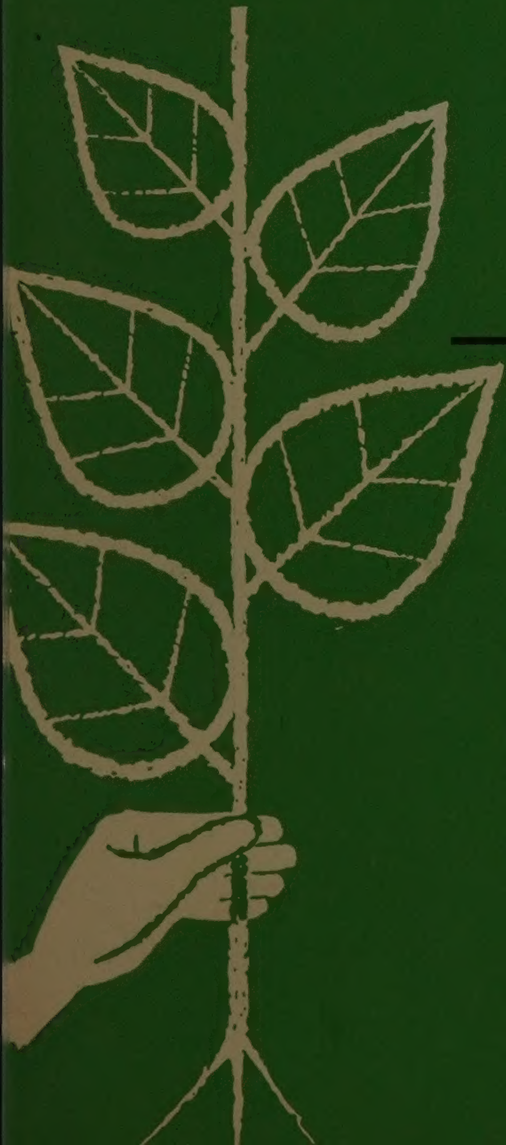

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FAO PLANT PROTECTION BULLETIN

is issued as a medium for the dissemination of information received by the World Reporting Service on Plant Diseases and Pests, established in accordance with the provisions of the International Plant Protection Convention, 1951. It publishes reports on the occurrence, outbreak and control of pests and diseases of plants and plant products of economic significance and related topics, with special reference to current information. No responsibility is assumed by FAO for opinions and viewpoints expressed in the Bulletin

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FAO PLANT PROTECTION BULLETIN

A PUBLICATION OF THE WORLD REPORTING SERVICE ON PLANT DISEASES AND PESTS

The Virus Complex Causing Swollen Shoot Disease of Cacao in West Africa

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Cacao is grown in many tropical countries and virus diseases have been reported in Ghana, Nigeria, Ivory Coast, Sierra Leone, Trinidad and Ceylon. They may also occur in Java, Sumatra and South America, where suspicious symptoms have been recorded (8). The viruses and the diseases they cause have received little attention except in Trinidad and West Africa, where numerous symptomatically distinct isolates have been made and ascribed to three distinct viruses (9). The cacao necrosis and cacao mottle leaf viruses have a limited distribution and are unimportant. By comparison, the virus complex causing swollen shoot disease is widespread and one of the most important factors influencing yield. The relationships between the swollen shoot viruses form the subject of the present paper. They are complex and equivocal and have parallels with problems encountered in classifying viruses of other crops.

The collection of different isolates

The symptoms on trees affected by swollen shoot disease in West Africa are not always the same, and swellings are common in some outbreaks but rare or even absent in others. The leaf symptoms also differ in type and severity between and within outbreaks. These differences can be caused by the host, but typical isolates from dissimilar outbreaks usually cause equally dissimilar but consistent symptoms on uniform test plants.

More than a hundred symptomatically distinct isolates have been studied and even more could be obtained with increased attention to the finer details of symptom expression. Different isolates from the same outbreaks and localities are most readily distinguished by their virulence in seedlings, as they cause symptoms differing in severity but not in type. By comparison, typical isolates from widely different areas cause symptoms which differ in type and perhaps also in severity (Figure 1). These minor differences between isolates from the same trees and outbreaks and greater differences between isolates from elsewhere are a feature of cacao swollen shoot disease and have parallels with the situation in other crops (3).

Criteria available for classifying isolates

Symptoms are notoriously unreliable for indicating relationships between viruses affecting the same host and attempts have been made to find other criteria for classifying the numerous isolates from cacao.

1. *Physico-chemical properties and serology.* The inability to transmit any of the cacao viruses by sap inoculation means that there is no information on their properties in *vitro* and attempts to produce antisera have failed.

2. *Insect transmission and vector specificity.* The different isolates causing cacao swollen shoot disease are not uniformly transmitted

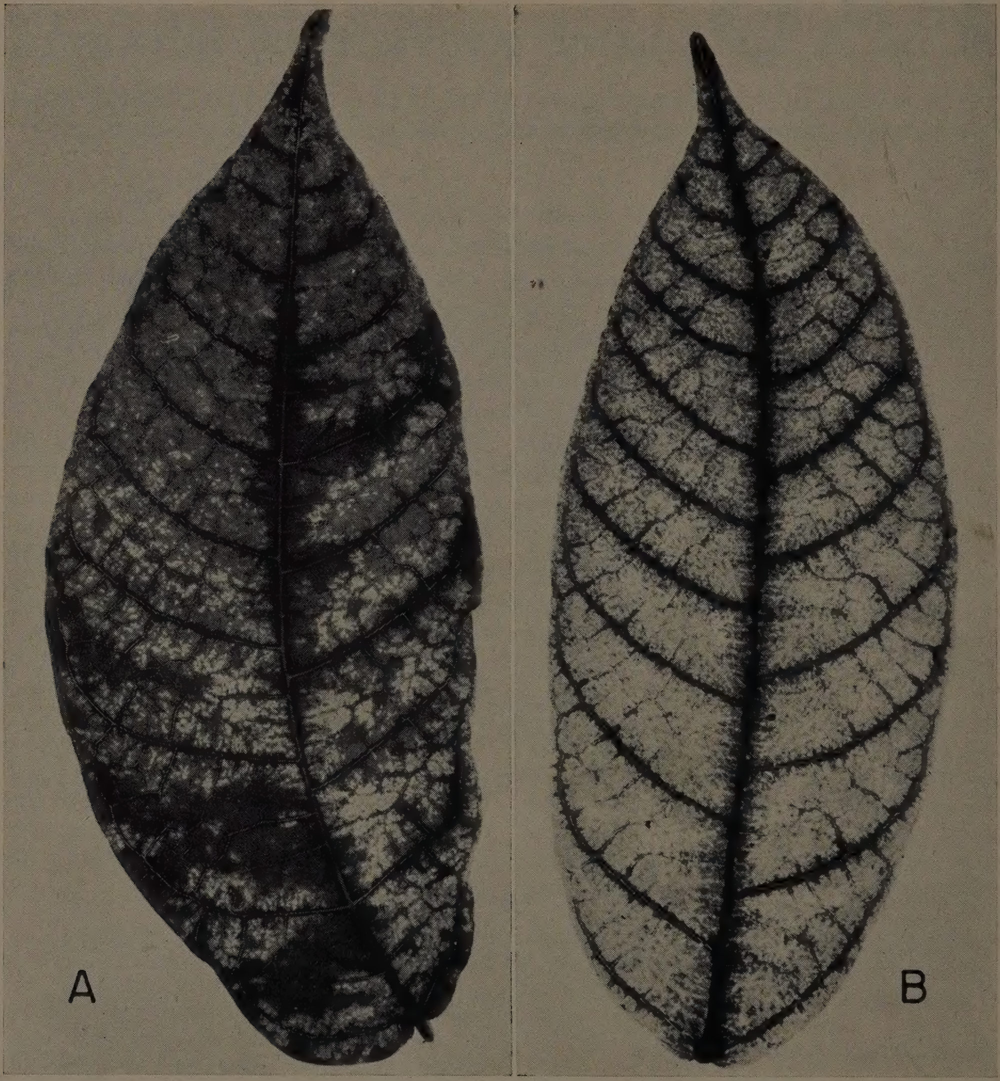

Figure 1. Symptoms caused by different isolates of cacao swollen shoot virus. A. Conspicuous leaf symptoms caused by an isolate from an outbreak found near Abuku in the Ibadan Province of Nigeria. B. Extensive chlorosis caused by an unrelated isolate from Egbeda in the Ibadan Province of Nigeria.

by all the mealybug species which are vectors and this suggests a possible approach to classification, as with other viruses (5). However, only a few of the isolates have been investigated, the key mealybug species are not always readily available and concentration effects may mask qualitative differences between isolates. This makes experiments difficult to standardize and the available results are inadequate. Virus-vector relations as used

to distinguish the viruses of strawberry and other crops are also of limited value and all the isolates yet tested have been transmitted in a similar way.

3. *Host range.* Many viruses and virus strains have been characterized by their host range, but this approach has been limited with cacao viruses which seem to infect only some species in the Tiliales and Malvales.

The New Juaben isolate seems to have the widest host range, which includes all the species known to be susceptible to other isolates (10). These may be grouped according to their ability to infect three key species, but only a limited number of isolates have yet been investigated and large-scale work is difficult. This is because some susceptible species resist or tolerate infection and often show inconspicuous or transient symptoms. Furthermore, mealybugs must be used for the inoculations and to identify virus in suspected hosts.

4. *Protection test.* Plants already infected with one virus are often immune or show no additional symptoms when inoculated with a related strain. By comparison, unrelated strains usually super-infect and cause additional symptoms and effects on growth. Tests using these interference phenomena have given particularly valuable evidence on strain relationships with viruses of many different crops (1).

Numerous tests have been done with isolates from cacao and grafts have been used for most of the inoculations. One difficulty has been to recognize the symptoms of the challenging isolate whenever they occur on plants already infected with the first. This means that the interpretation of the results is equivocal unless the tests are limited to pairs of isolates which cause symptoms differing greatly in type or severity. Furthermore, reciprocal tests are desirable but not always possible, because virulent symptoms can be recognized on plants already infected with a mild strain but not vice versa. Despite these limitations, certain virulent isolates consistently fail to produce additional symptoms on plants infected with a mild strain. Other viruses fail to cause recognizable symptoms on plants already showing the usual symptoms of the first inoculation. However, such instances of interference are rare and most tests have failed to suggest any close relationships between typical isolates from different localities in the Ivory Coast, Ghana and Nigeria. Because of this, it has been suggested that the whole technique should be re-examined and mealybugs used for the challenging inoculations (9). There are also possibilities of using the Holmes test (4) for virus relationships (7). This is based on the observation that unrelated (but not related) pathogens usually have cumulative effects on the growth of their host.

Relationships between isolates causing swollen shoot disease

Protection tests provide the only reliable evidence on relationships between the numerous isolates causing swollen shoot disease and can be used to distinguish numerous groups. Isolates in the different groups do not interprotect, have cumulative effects on growth and cause dissimilar leaf symptoms. By comparison, the isolates within each group interprotect, do not have cumulative effects on growth and cause symptoms of a similar type. They may, however, differ greatly in the severity of their effects. For example, some isolates cause only mild symptoms and have barely detectable effects on growth, whereas others cause conspicuous swellings and leaf mosaic, resulting in severe stunting and perhaps death. This emphasizes the misleading nature of a classification based on the ability of the different isolates to cause stunting, swellings and the various leaf symptoms. This approach was attempted but has now been abandoned.

In Ghana, most attention has been given to the group of interprotecting isolates collected from the New Juaben district of the Eastern Province. These isolates also interprotect with others collected from more distant localities near Konongo and Sedi Nkawie in Ashanti and from Kongodia in the Ivory Coast. Numerous other isolates have been made from Ghana and the Ivory Coast and these do not usually protect against those from New Juaben or against each other.

There have been few experiments with different isolates from adjacent trees and localities and the available results of protection tests may give a false impression of heterogeneity. However, isolates which do not interprotect have been collected from adjacent trees at Mamfe and similar results have been reported from the Western Province, where the situation is particularly complex. This may be due to the frequent spread of virus from indigenous hosts, in which mutation and selection may have occurred for many years.

Groups of interprotecting isolates also occur in Nigeria and the one from Egbeda includes several which cause symptoms differing in intensity and virulence. Other isolates which interprotect have been collected from outbreaks near Offa-Igbo and a further group from Abaku. The two isolates from Olanla and one collected 65 miles away at Ilesha form an additional group. These localities are the only ones to have been investigated in detail. Elsewhere in Nigeria many other isolates are known to be immunologically distinct and additional tests on material from the field will probably reveal that they too have numerous related strains.

Protection clearly indicates close relationships and the isolates within each group are most conveniently referred to as related strains. The status of the many different groups is more equivocal. Failure to protect may mean that some or all of them should be referred to as distinct viruses. Alternatively, the protection tests may be taken to indicate only the closest affinities between the strains of related viruses. This is certainly a convenient assumption, because all the groups cause virtually the same disease and it would be unreasonable and misleading to give them separate names. For this reason, swollen shoot disease is considered to be caused by a complex of closely related cacao swollen shoot viruses, which have a similar host range, cause similar symptoms in cacao and are unusual in having mealybug vectors.

Analogies with viruses of other crops

The classification of the cacao swollen shoot viruses has been made particularly difficult by the failure to produce antisera and by the limited results from protection tests. The situation with many other viruses is similar. For example, the viruses causing curly top of sugar beet in the Americas also occur in numerous immunologically distinct groups, cause virtually the same disease and have similar leaf hopper vectors. Furthermore, sugar beet in the Americas and cacao in West Africa are exotics and may have been infected recently by the spread of virus from indigenous hosts.

There are several serologically unrelated tobacco necrosis viruses, but they have not been given separate names because they all cause similar diseases and have similar physicochemical properties. They may be analogous to the complex of swollen shoot viruses and the ring spot viruses are also comparable. Several of these cause distinct diseases, are unrelated serologically and are given separate names. Nevertheless, they may be transmitted in the same way and have similar properties. Each virus also occurs in numerous distinct strains and only the most closely related ones in each group will interprotect (3). As with the swollen shoot viruses, related strains usually come from nearby localities, with greater differences between those from elsewhere.

It is not proposed that binomial nomenclature should be introduced for cacao viruses, but the strains and groups of the swollen shoot complex may correspond or be at least analogous to the varieties and species of higher organisms. On this terminology the complex itself becomes a genus and this grouping of related viruses may indicate phylogeny. It is certainly convenient to assume that the swollen shoot viruses have had a common origin, perhaps in indigenous hosts, long before cacao was introduced to West Africa. This cannot be proved but cacao viruses which do not interprotect are now known to occur in *Cola chlamydantha* K. Schum. growing in different parts of remote forest reserves in the Western Province of Ghana (11). Furthermore, interference between strains within the New Juaben group does not always result in complete protection (6). This indicates different degrees of relationship and related strains

may eventually diverge until interference is no longer detectable.

Comparable evolutionary trends could explain the development of the ring spot viruses from a common source ; similarly with viruses causing cucumber mosaic, and aspermy disease. These groups and the tobacco necrosis and beet curly top viruses may be conveniently referred to as genera and many others may be proposed. However, as Bawden (1) has stated, their arrangement into the equivalent of families and orders is at present obscure and may have to await further physical or chemical techniques. Alternatively, other features such as mode of transmission and particle morphology could be employed (2). For example, many workers have already stressed the apparent similarities between the leaf hopper transmitted viruses causing diseases of the "yellows" type. Similarly, Bawden has stressed the affinities between potato virus Y, henbane mosaic virus, tobacco etch and soybean mosaic viruses and others which do not persist in their aphid vectors. A further group could comprise the viruses which have spherical particles and which can be crystallized. These also resemble each other in physico-chemical features, are inactivated in the same way and cause diseases including turnip yellows, turnip crinkle, bean southern mosaic and squash mosaic.

Summary

Cacao necrosis and cacao mottle leaf viruses have limited distributions in West Africa and are unimportant. By comparison, the cacao swollen shoot viruses are widespread and occur in numerous symptomatically distinct forms. There are usually only minor differences between isolates from the same outbreaks and localities, with greater differences between isolates from dissimilar areas. The isolates may differ in host range and are not uniformly transmitted by all the mealybug species which are vectors.

Isolates from the same trees, outbreaks and localities usually protect against each other but not against isolates from elsewhere. This suggests that isolates in the swollen shoot complex can be arranged into groups, within but not between which the strains interprotect and are closely related.

The situation with the cacao swollen shoot viruses resembles that with viruses of certain other crops, in which similar difficulties have been encountered in developing suitable criteria for classification.

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OUTBREAKS AND NEW RECORDS

NICARAGUA

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Occurrence of citrus blackfly

Although literature records the presence of the citrus blackfly (*Aleurocanthus woglumi* Ashby) in Mexico and Costa Rica, its distribution in other Central American countries is little known. Reports from Guatemala, El Salvador and Honduras indicate that this species still has not been encountered within these countries. In Nicaragua, however, specimens of *A. woglumi* collected on citrus in a backyard property in Managua, were identified by the writer. Individual citrus leaves were found to be heavily infested.

The writer has also observed light infestations of the citrus blackfly on leaves of sweet orange (*Citrus sinensis*) in the citrus-producing region near San Marcos. Sr. Carlos M. Marín, Chief of the Plant Protection Department of Nicaragua, has also reported the presence of this species to the writer.

Although no effort has been made to control the citrus blackfly in the area where light infestations were noted, there is no record of excessive damage being caused. Therefore, it is possible that when this species was introduced into Nicaragua, its natural enemies accompanied it. In Costa Rica, where the citrus blackfly also occurs, the writer has observed a similar situation.

PERU

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Andean disease of potatoes on the coastal plain

Andean disease (*Thecaphora solani*) of potatoes, even when Abbott[1] first reported its presence in Peru with the erroneous identification of its cause as *Spongospora subterranea*, was recognized as one of the most damaging potato diseases in the mountain areas. It was established later in Venezuela and Peru that this disease could be reproduced by growing healthy tubers in soil inoculated with diseased tubers.

As reported earlier,[2] Andean disease was known to affect potatoes only in the mountains until it was found in 1954 by A. Quevedo at the La Molina Station on the coastal plain of Peru. In 1958 it was reported to cause severe losses to the variety Peruanita at a large plantation in the lower Rimac Valley and in 1959 light infections were observed in Cañete on the same potato variety.

A survey was carried out in late December 1959 in the Bocanegra, San Agustín and Oquendo farms in the lower Rimac Valley in order to determine the behavior of Andean disease in the coastal area. In those farms the variety Peruanita was introduced into planting about eight years ago and was apparently the only one in cultivation during the last three or four years because of its adaptability and its high-yielding ability.

Inspection of potato tubers in storage on these farms revealed that no trace of the disease could be found in potato storages located on the higher fields, whereas an alarming amount of diseased tubers occurred in storages on the lower fields. This was in accordance with the information obtained from farm workers that the Andean disease practically did not occur in the higher fields with rather low moisture content, while crop losses

[1] Abbott, E. V. 1931. Enfermedades de las plantas cultivadas en Perú. *Est. Exp. Agr. La Molina. Circ.* 18, pp. 20-21.

[2] Bazán de Segura, C. 1959. Observations on potato diseases in Peru. *FAO Plant Prot. Bull.* 7: 99-100.

in 1959 due to this cause attained 60 to 80 percent in lower fields with soils more moist and saline. They also reported that the first light infection was observed in 1957 and crop losses increased to more than 50 percent in 1958.

Since precise data on the incidence of Andean disease in the mountain areas of Peru were not available, factors governing the development of the disease cannot be determined. From the scanty information obtained in Peru and elsewhere, it may be concluded that Andean disease is disseminated mainly by infected seed potatoes and that in the coastal area high moisture content and salinity of soils seem to favor the development of the disease. Once the pathogen has been introduced into soils favorable to its development, the disease is perpetuated and increased by the successive planting of potatoes. The Peruanita variety appears to be particularly susceptible, since the disease has not been observed on any other variety, such as Huasatuasi, which has been grown in the same area for many years.

In view of the growing importance of the Andean disease in the coastal area, it is suggested that varietal trials should be carried out in the Rimac Valley.

UNITED ARAB REPUBLIC

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Occurrence of leaf curl of cotton in Egypt

In 1957, symptoms of the leaf curl disease were observed for the first time in Egypt in some of the long staple Egyptian cotton varieties in a limited field of 12 acres at Kafr El-Dawar. In 1958, the disease appeared in practically all cotton fields in varying severity in the Behera Province.

The affected cotton plants showed symptoms typical of the disease caused by the leaf curl virus which has hitherto been found mainly in the Sudan and Nigeria. The most conspicuous symptoms of the disease were the severe stunting of the infected plants and the characteristic deformation of the top leaves. Chlorosis, thickening and clearing of the veins (Figure 1), accompanied by the transformation of the leaf tip into a prong-like structure, gave the diseased fields a peculiar appearance.

Figure 1. Symptoms of cotton leaf curl in Egypt, showing leaf deformation, vein-clearing and chlorosis.

The disease was rather severe in April, when cotton plants were still young and temperatures relatively low, averaging about 20° C. Later, when temperatures were becoming gradually higher, diseased plants began to recover and the newly developed leaves assumed normal growth. It is believed that high temperatures may have profound effects in inactivating the virus inside the infected plants. This might have been the reason that the disease remained unnoticed until 1957. The recovered diseased plants, however, probably could not be as productive as healthy ones.

The source of infection of this disease and its insect vectors have not yet been determined in Egypt, especially since the known vectors of the virus, *Bemisia* spp., have not been reported in the country. Investigations are being planned to find out the mode of transmission and the host range of this virus.

PLANT QUARANTINE ANNOUNCEMENTS

CZECHOSLOVAKIA

Government Decree No. 1 of 9 January 1959, published in *Sbirka zákonu* No. 1 of 2 February 1959, regulates importation, transportation and exportation of plant material. It replaces Government Decree No. 8/1951.

For the purpose of these regulations, the term "plant material" refers to all goods of plant origin (fresh or dried, including milled, grounded, peeled, pressed or otherwise treated products) and living plant pests and disease-causing agents. The term covers plants and parts thereof (including fruit and seed), wood with bark and unprocessed bark, cork and peat.

Requirements for importation

Plant material destined for importation must be accompanied by a phytosanitary certificate issued by a competent officer of the country of origin, stating that the material is free from pests and diseases whose introduction is prohibited. A phytosanitary certificate, however, is not required for post parcels containing fruits or vegetables, plant material carried by travelers for their own consumption, and plant material for consumption by persons with privilege or immunity.

Imported plant material, except ornamental and medical plants, must not have more than 1 percent soil adhering to it.

The Agriculture and Forestry Division of the District People's Committee must be notified of the importation of any plant material by the transportation agency if the goods are introduced by rail, waterways or air, or by the customs office if the goods arrive by road. Plant material including its packing is subject to inspection at the point of entry.

Living pests and disease-causing agents may be imported only under a permit issued by the Ministry of Agriculture and Forestry.

Plant material in transit, except wood with bark and unprocessed bark, cork and peat, must be shipped in sealed wagons, or according to the nature of the goods, in closed undamaged wagons or containers. If this requirement is not met, the transport agency should notify the Division of Agriculture and Forestry of the District People's Committee.

In certain cases the Ministry of Agriculture and Forestry may grant exemptions from these regulations.

Border traffic

Border traffic is governed by special agreements with neighboring countries. Where no such agreement exists, or where the agreement does not contain provisions for preventing the introduction of pests and diseases, the Ministry of Agriculture and Forestry will indicate the measures to be taken.

Prohibited pests and diseases

1. Plant material infected or infested by the following species will be refused entry:

Heterodera rostochiensis
Ditylenchus dipsaci
Taeniothrips gladioli
Piesma quadratum
Viteus vitifolii (*Phylloxera vastatrix*)
Quadraspidiotus perniciosus
Leucaspis japonica
Pseudococcus comstocki
Leptinotarsa decemlineata
Popillia japonica
Pantomorus leucoloma
Caulophilus latinasus
Hyphantria cunea
Gnorimoschema ocellatella
G. operculella
Laspeyresia molesta
Numonia pirivorella
Graciliaria azaleella
Tortrix pronubana
Acalla (*Argyrotoza*) *schalleriana*
Ceratitis capitata
Rhagoletis pomonella

Eumerus strigatus
E. tuberculatus
Lampetia equestris
L. clavipes
Synchytrium endobioticum
Exobasidium azaleae
Aphelenchoides fragariae
Tarsonemus fragariae
Pseudomonas hyacinthi
Ophiostoma ulmi
Chalara quercina
Endothia parasitica

2. Plant material affected or contaminated by the following will be treated or processed before release:

Bruchidae
Calandra spp.
Scolytidae
Plodia interpunctella
Ephestia sericarium (*E. kühniella*)
Corcyra cephalonica
Sitotroga cerealella
Polyspora lini
Mycosphaerella (*Phlyctaena*) *linicola*
Tilletia controversa
Cuscuta spp.
Orobanche spp.

NEW ZEALAND

Plant Quarantine Regulations 1957, Amendment No. 1, published in the *Gazette* on 17 December 1959, provides certain changes concerning fees payable for inspection and fumigation, and concerning the importation of the following plant materials:

1. Imported tomato seeds will be seized by the inspecting officer or the customs officer if the seeds have not been extracted by an approved method.

2. Importation of *Fagus* spp. from all countries and places is prohibited on account of diseases caused by *Microsphaeria alphitoides*, *Nectria* sp. and *Strumella coryneoidea*; importation of *Nothophagus* spp. from South America and Australia is prohibited on account of diseases caused by *Cyttaria* sp. and *Taphrina* sp.

3. Importation of seed of elms (*Ulmus* spp. and *Zelkova* spp.) from North America, Europe, United Kingdom and the Republic of Ireland is permitted, while elm plants from those countries remain prohibited.

4. In the schedule of prohibited fruit, plants and plant products to the Plant Quarantine Regulations 1957, the words "Great Britain" are substituted by "United Kingdom."

Plant Quarantine Regulation 1957 was abstracted in the *FAO Plant Prot. Bull.* 6 : 60-63, 1958.

SPAIN

Order of 15 October 1959 of the Ministry of Agriculture, published in the *Boletín Oficial del Estado* on 21 October 1959, specifies phytosanitary and quality requirements of seed potatoes destined for importation. The importation of potatoes was liberalized by an Order of 29 July 1959 of the Ministry of Commerce. The main provisions of the Order of 15 October 1959 are as follows:

Freedom from pests and diseases

1. Potatoes originating from countries where unidentified virus diseases or virus diseases not widespread in Europe occur, especially potato spindle tuber, potato witches' broom, aucuba mosaic (Canada streak), potato calico, may be used only for consumption but not for planting.

2. Seed potatoes must originate from fields free from potato wart (*Synchytrium endobioticum*), potato root eelworm (*Heterodera rostochiensis*), meadow nematode (*Pratylenchus pratensis* = *Anguillulina pratensis*), potato flee beetle (*Epitrix cucumeris*), ring rot (*Corynebacterium sepedonicum*), and bacterial wilt (*Pseudomonas solanacearum*). Potato wart must not occur within 15 kilometers from the place of cultivation and the two nematodes mentioned above must not occur within 10 kilometers from the place of cultivation. Phytosanitary certificates to this effect must accompany the consignment.

3. Seed potatoes together with their packings to be imported into the provinces of Baleares

and the Canary Islands must originate from a country where Colorado beetle (*Leptinotarsa decemlineata*) does not occur and the consignment must be free from this pest.

Packing and certification

Seed potatoes must be packed in new containers. The name of the variety and the Spanish inscription "Patata de siembra" must be marked outside the containers. Inside each container must be enclosed a certificate issued by a competent authority of the country of origin, stating that the merchandise covered is seed potatoes and indicating the country of origin, the area of cultivation, the name of variety, grade and size, and the date of sealing the containers.

Quality requirements

1. Seed potatoes imported must be within the following tolerance limits:
   - Tubers of mixed varieties 2%
   - Out of size tubers 4%
   - Cut, deformed, cracked and rotten tubers 2%
   - Soil and foreign matter 1%

The total number of tubers with the above defects must not exceed 6 percent.

2. Seed potatoes imported must be within the following limits in disease tolerance:
   - Blight (*Phytophthora infestans*) 0.5%
   - Dry rot (*Fusarium coeruleum*) 0.5%
   - Common scab superficial infection (*Actinomyces scabies*) 2%
   - Common scab deep infection and black scurf (*Rhizoctonia solani*) 1%

The total number of tubers with above diseases may not exceed 2 percent. Tubers are considered affected by common scab when more than one twentieth of the surface is covered by scab lesions.

3. A consignment may not contain tubers with sprouts longer than 1 centimeter.

4. Only potatoes of the following or higher certification grades may be imported as seed potatoes from the countries indicated:
   - Germany: "Hochzucht"
   - Denmark: "A"
   - Scotland: "Certified"
   - France: "A"
   - Ireland: "A"
   - Netherlands: "B"

For seed potatoes imported from other countries, a certification grade equivalent to those listed above is required.

5. Only the following varieties may be imported as seed potatoes:

Ackersegen	Majestic
Alpha	Merkur
Allerfrüheste Gelbe	Ostbote
Arran Banner	Profijt
Arran Pilot	Red Pontiac
Bea	Royal Kidney
Bintje	Sabina
Bona	Santa Lucia
Duke of Kent	Saskia
Essex	Saucisse Rouge
Etoile du Léon	Sieglinde
Furore	Sientje
Gineke	Sirtema
Heida	Up to Date
Institut de Beauvais	Urgenta
Kennebec	Valencia
Konsuragis	Voran

NEWS AND NOTES

INTERNATIONAL CONFERENCE ON CITRUS VIRUSES

The Second Conference of the International Organization of Citrus Virologists will be held at Lake Alfred and Orlando, Florida, 7-11 November 1960. It is expected that in view of the success of the first conference many of the citrus-growing countries will be represented. In addition to the presentation of papers on experimental work in progress, field trips will be organized to visit citrus-growing areas, with special attention given to the budwood certification program at the Florida State Plant Board Nursery at Winter Haven, and the spreading decline disease sampling, pull and treat methods.

Enquiries with regard to the Conference should be addressed to : Dr. T. J. Grant, Committee on Arrangements and Program, 2120 Camden Road, Orlando, Florida.

Proceedings of the first conference were published under the title "Citrus Virus Diseases" and are obtainable from Agricultural Publications, University of California, Berkeley 4, California.

INTERNATIONAL CONFERENCE ON SEED PATHOLOGY

The Committee on Plant Diseases of the International Seed Testing Association (ISTA) has been making special efforts in recent years in the development and standardization of laboratory seed health-testing methods. Since 1957 the Committee has organized international co-operative testing of samples of infected seed lots mainly of crops of temperate countries. The results of those tests were discussed in two international conferences on seed pathology sponsored by the Committee, one in Cambridge in May 1958, and the other in Edinburgh in June-July 1959.

In view of the need for a similar seed-testing scheme for subtropical crops, a series of tests involving rice and maize was initiated in 1959 with the collaboration of plant pathologists in the Near East and the Mediterranean area. In order to intensify these efforts and review the results of these tests, the Third International Conference on Seed Pathology was held at the School of Agriculture of the American University of Beirut, Lebanon, 8-14 February 1960.

Among the 29 stations in 25 countries which have carried out the tests, results from most of them were available at the Conference. While there was good agreement in the results obtained by different stations in certain pathogens, considerable discrepancies occurred in others. Factors causing such discrepancies were discussed and the major factors appeared to be the difficulty in the identification of certain fungi, the lack of standardization of media, and the variation of environmental conditions during the incubation period.

With regard to its future work, the Committee decided that the comparative seed health testing should give major attention in the immediate future to wheat, rice, maize, barley and pea. The preparation of distribution maps of important seed-borne diseases of the world's major crops will receive adequate consideration. It was recommended that the Fourth Conference on Seed Pathology be held in Paris, in the summer of 1961, and the Fifth Conference in Lisbon, in the summer of 1962, immediately before the Thirteenth International Seed-Testing Convention.

EUROPEAN SYMPOSIUM ON VIRUS DISEASES OF FRUIT TREES

The Fourth Symposium on Virus Diseases of Fruit Trees in Europe will take place at Lyngby, Denmark, 25-30 July 1960. Experts from 23 countries, including several from overseas, are expected to participate.

In addition to the presentation of technical papers concerning mainly recent progress on investigations of viruses affecting pome fruit and stone fruit trees, international co-operation to promote research and to strengthen extension work in this field will be discussed. A European bibliography on fruit tree viruses covering the period from 1956, when the third symposium was held at East Malling, to 1959 will be presented. Excursions, including a visit to the State Plant Pathology Station, Lyngby, and field demonstrations will be arranged during the meeting.

For further information, enquiries should be addressed to: H. Rønde Kristensen, Organizing Secretary, Statens Plantenpatologiske Forsøg, Lottenborgvej 2, Lyngby, Denmark.

STABILIMENTO TIPOGRAFICO FAUSTO FAILLI — ROMA

IRRIGATION BY SPRINKLING

FAO Agricultural Development Paper No. 65

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